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Supplemental Appeal Brief (in triplicate)

Attorney Docket No.: 13DV-12817 (07783-0046)
Application No.: 09/613,162
Filed: July 10, 2000

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	09/613,162
Filing Date	July 10, 2000
First Named Inventor	MESING et al.
Art Unit	1733
Examiner Name	MUSSER, BARBARA J.
Total Number of Pages in This Submission: 89	Attorney Docket Number: 13DV-12817 (07783-0046)

ENCLOSURES ***(check all that apply)***

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
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- ☐ After Allowance Communication to Group
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- ☒ Appeal Communication to Group **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
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Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	McNees Wallace & Nurick LLC Carmen Santa Maria
Signature	Carmen Santa Maria
Date	September 14, 2004

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13DV-12817 (07783-0046)

AF/GP1733 IFW

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Mesing et al.	:	
	:	
Serial No. 09/613,162	:	Group Art Unit: 1733
	:	
Filed: July 10, 2000	:	Examiner: Musser, Barbara J.
	:	

For: POLYIMIDE RESIN AND CARBON FIBER MOLDED TUBE CLAMP

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Alexandria, VA 22313-1450

Sir:

SUPPLEMENTAL APPEAL BRIEF

Applicant hereby requests reinstatement of the appeal. Any other charges necessary for consideration of this appeal may be charged to McNees, Wallace & Nurick Deposit Account No. 50-1059. In accordance with 37 C.F.R. 1.192, this supplemental brief is being filed in triplicate.

This Supplemental Appeal Brief is filed in response to rejection dated 6/16/04 after the Examiner reopened prosecution of the application. The rejection dated 6/16/04 represents the fourth rejection of the Examiner.

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1. REAL PARTY OF INTEREST

The real party of interest in this pending application is General Electric Company, Assignee of inventors' interest, which assignment has been duly recorded in the United States Patent and Trademark Office on July 10, 2000, at Reel/Frame No. 10931/0033.

2. RELATED APPEALS OR INTERFERENCES

There are no other appeals or interferences known to Appellants' legal representative or Assignee which will directly affect, or be directly affected by, or have a bearing on the Board's Decision in this pending appeal, nor are there any directly related co-pending applications known to Appellants' legal representative.

3. STATUS OF CLAIMS

Claims 1-35 were pending in the present application. Claims 13-30 are subject to a restriction requirement and have been canceled from consideration without prejudice. Claims 1-12 and 31-35 are thus pending in the application. Claims 1-12 and 31-35 have been rejected for a fourth time by the Examiner. Appellants' response to the third office action is addressed in the Appeal Brief. In the fourth office action, the Examiner rejected claim 11 under 35 U.S.C. §112 and rejected claims 1-12 and 31-35 under 35 U.S.C. §103(a).

4. STATUS OF AMENDMENTS

Appellants submitted no response to the third office action rejection of December 3, 2003, rejecting claims 1-12 and 31-35 for a third time and exercised their rights under 37 C.F.R. §1.191 by filing an appeal brief which does contain their response.

Appellants have submitted no response to the fourth office action rejection of June 16, 2004, rejecting claim 11 under 35 U.S.C. §112 and claims 1-12 and 31-35 under 35 U.S.C. §103, instead exercising their rights to respond by filing this Supplemental Appeal Brief.

5. SUMMARY OF INVENTION

The Summary of the Invention remains as stated in that Appeal Brief filed on March 26, 2004, incorporated herein by reference. The Appellants have recognized, as a result of the most recent rejection by the Examiner, that, in addition to what was said in the Appeal Brief, that Appellants utilize a combination of prepreg lay-up techniques and RTM techniques to achieve the improved tube clamp of the present invention in which the prepreg fibers lie in a plane parallel to the tooling surface, thereby resulting in a tube clamp in which the prepreg fibers are parallel to a tube surface so that fiber ends do not abrade the tube.

6. ISSUES

Issues A-D below were identified and addressed in the Appeal Brief submitted March 26, 2004 in response to the Office Action of December 3, 2003, which Office Action included rejections that have not been withdrawn. Issues A-D remain the same, but the Appellants' Arguments will be supplemented as required due to new arguments presented by the Examiner in the Office Action of June 16, 2004. Where appropriate, cross-reference to the Appeal Brief submitted March 26, 2004 will be made. Issues E and F are new, as is G, Appellants rebuttal to the Examiner's Response to Arguments.

A. Whether Doyle, as used by the Examiner, teaches away from Wiley, and whether Doyle is properly combinable with Wiley to establish prima facie obviousness under 35 U.S.C. §103.

B. Whether Wiley in view of Doyle, Livesay and admitted prior art, even if properly combinable, yield Appellants' claimed invention.

C. Whether the claimed invention as a whole must be considered.

D. Whether the combination of Wiley in view of Doyle, Livesay et al. and the admitted prior art is based on hindsight reasoning by the Examiner.

E. Whether claim 11 is properly rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirements.

F. Whether claim 11 is properly rejected under 35 U.S.C. §112, second paragraph., as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention.

G. Rebuttal to Examiner's Response to Arguments

7. ***GROUPING OF CLAIMS***

Claims 1-12 and 32-35 are rejected under 35 U.S.C. §103(a) as being unpatentable over Wiley in view of Doyle, Livesay et al. and the admitted prior art.

The claims do not stand or fall together. Claim 1 is an independent claim. Claims 1, 5, 9 and 10 stand and fall together. Claim 2 does not stand or fall with claim 1. Claim 2 adds further additional limitations regarding sheet fiber orientation (unidirectional) and the contour of fibers in the cured material after removal from the tooling and its patentability should be considered in light of these additional limitations. Claims 3 and 4 stand or fall together, but not together with claims 1 or 2. Claim 3 adds different limitations regarding sheet fiber orientation (bidirectional or woven) and the contour of fibers in the cured material after removal from the tooling. The patentability of claims 3 and should be considered in light of these different limitations. Claims 6- 8 and 31-35 stand or fall together, but not with the claim groupings of claims 1, 2, 3, 4, 5, 9 or 10, and their patentability should be considered in light of their additional limitations.

Claim 11 does not stand or fall with claims 1-10. Claim 11 is an independent claim and differs from claim 1 in that it requires injection molding a polymer into a fiber bundle comprised of a plurality of sheets, thereby filling void regions in the fiber bundle, in which fibers are not exposed when the cured tube clamp is removed from the layup tooling. The patentability of claim 11 should be considered in light of its limitations.

Claim 12 does not stand or fall with the other claims. Claim 12 incorporates additional limitations and its patentability should be considered in light of these additional limitations.

Claim 31 is rejected under 35 U.S.C. §103(a) as being unpatentable over Wiley in view of Doyle, Livesay et al, and the admitted prior art as applied to claim 2 and further in view of

Yamamoto et al. Although an additional reference is cited against this claim, it stands or falls with claims 6-8 and 32-35 as noted above.

8. ARGUMENTS

A. Re Doyle, As Used by the Examiner, Teaches Away From Wiley, And Is Not Properly Combinable with Wiley to Establish Prima Facie Obviousness Under 35 U.S.C. §103.

Wiley, U.S. Patent No. 5,435,506, Doyle, U.S. Patent No. 5,271,588 and Livesay et al., U.S. Patent No. 5,837,185, were discussed in the Appeal Brief submitted on March 26, 2004 and, for the sake of brevity, that discussion is incorporated herein

In Paper No. 13, the Examiner rejects claims 1-12 and 32-35 under 35 U.S.C. §103(a) as being unpatentable over the combination of Wiley in view of Doyle, Livesay et al., and the admitted prior art. In the new Office Action rejection dated June 16, 2004, the Examiner repeats the rejection from Paper No. 13 as follows:

> Wiley discloses forming tube clamps by compression molding fiber-reinforced polymer in the shape of a tube clamp and then removing the shaped material from the mold (Col. 3, ll. 44-57). While the reference discloses polyamide, a thermoplastic, the material listed, PMR-15, is a mixture of polyimide and carbon fibers as shown by Doyle (Col. 6, ll. 40-41). Clearly, the use of polyamide rather than polyimide is a spelling mistake in Wiley. Thus, the material used, PMR-15, is a thermosetting material, i.e. is capable of curing. One in the art would understand that the material was cured, as that is how thermosetting materials are intended to be used.

In the new Office Action rejection, dated June 16, 2004, the Examiner adds the following new reasoning to the previous grounds of rejection:

> While the reference does not specifically disclose using preforms in the compression molding operation, the reference does call the material a composite prior to compression molding (Col. 3, ll. 44-45) and the dictionary defines a composite as a solid material comprised of two or more substances having

> different physical properties. Therefore, Wiley et al. discloses compression molding a solid preform. In a prepreg, the fibers lie within the sheet. Therefore, after compression molding, the fibers would still lie within the sheet and would not be exposed.

Appellants traverse this new ground of rejection. While the Appellants do not dispute the first portion of this reasoning, that the reference does call the material a composite, Appellants dispute that it is a composite until after compression molding is completed. Appellants also do not argue at this time that the dictionary definition proffered by the Examiner is one of the available definitions for a composite. Appellants prefer the more technically accurate definition set forth in ASM Handbook, Volume 21, Composites, page 3, which define a composite material as "a macroscopic combination of two or more distinct materials, having a recognizable interface between them." Appellants acknowledge that the compression molded and cured composite of the reference would satisfy both the more precise definition of the ASM Handbook and the broad dictionary definition proffered by the Examiner.

Appellants also acknowledge that in a prepreg, the fibers lie within a sheet. However, Appellants find no teaching in Wiley et al. that discloses using sheets of prepreg fibers. The Appellants traverse the rejection based on the reasoning relied upon by the Examiner The Examiner's reasoning is that because Wiley et al. discloses a composite and because Wiley et al. discloses compression molding, then Wiley et al. must be compression molded prepreg. This is an incorrect and unsupported conclusion. The Examiner draws this faulty conclusion further by noting that the fibers within the prepreg would lie within the sheet and not be exposed. This last statement would be correct, if the compression molded article of Wiley et al.was prepreg. Of course, there is no such teaching and the reasoning in reaching this conclusion is flawed. In essence, the logic used by the Examiner is that all compression-molded articles are prepreg. This is not true.

The Examiner already has admitted that the Wiley et al. reference does not specifically disclose using preforms in the compression molding operation, as Appellants have previously pointed out. The logic used by the Examiner does not provide the teaching that the Examiner desires to reach, that is, the use of (undisclosed) prepreg sheets. Specifically the premise used by the Examiner is that because Wiley et al. discloses compression molding a composite, and prepregs are used in compression molding of some composites, therefore leads to a conclusion

that Wiley et al. discloses that the composite article is compression-molded prepreg. This conclusion is the result of false logic.

First, with reference to ASM Handbook, Volume 21, Composites, pages 516-535, the three main groups of material that are commonly compression molded include glass-fiber-mat-reinforced thermoplastics (GMT), long-fiber-reinforced thermoplastics (LFT) and sheet molding compounds (SMC). However, a further reading of the ASM Handbook indicates that GMT is a continuous line process. Further, as indicated at page 521, chopped fiberglass mat is one of the materials used in GMT. These two teachings correspond identically with the teachings of Wiley et al. which indicate in Col. 3, lines 49-53 that the graphite fiber is randomly oriented and that material is continuously molded. Thus, it is clear that the compression molding as that term is used in Wiley does not utilize prepreg, as that term is discussed and claimed in the present invention. Therefore, the Examiner's logic to support her position that somehow Wiley et al. uses prepreg sheets because it is compression molded is clearly incorrect. While Wiley et al. clearly describes both compression molding and randomly oriented fiber, one skilled in the art, armed with the prior art knowledge as taught by the ASM Handbook would conclude that Wiley et al. compression molds fiber mat using GMT. This process necessarily leads to an article having a different structure than an article produced by the method claimed by the present invention, and one skilled in the art would recognize that the process of Wiley et al. would produce a different structure than the process of the present invention.

The problem solved by Appellant, as noted on page 4, lines 15-16, 20-22, is a net molded fiber-reinforced structure in which exposed fiber ends are abrasive, the source of wear on a tube, are eliminated. This is achieved by the methods of independent claims 1, 11 and 12, in which the prepreg sheets are laid up along the contours of the tooling (i.e. each sheet lies parallel to the surface of the tooling) to a preselected thickness, cured and removed from the tooling without exposing the ends of the fibers, as expected of prepreg sheets lying parallel to the tooling surface. If the Examiner is to persist in maintaining that Wiley et al. utilizes prepreg sheet in forming a preform, the Examiner is requested to specifically identify in the Examiner's Response that portion of Wiley et al. that specifically discusses the use of prepreg sheet.

The Examiner then continues, returning to a portion of the rejection provided in Paper 13 and repeating that rejection. It is restated below for convenience:

> Wiley is silent as to whether one or more layers of material are used to form the tube clamp. However, using one or more sheets of fibers to form a composite is well-known per se in the composite molding arts as shown for example by Livesay et al. which discloses one or more fiber sheets can be laid-up in a mold to form a structure (Col. 4, ll. 12-17) and by the admitted prior art which discloses forming a tube clamp from multiple layers of material (Pg. 2-3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use multiple fiber layers as it is known in general in the molding arts to use one or more layers of fibers to form a product as shown for example by Livesay (Col. 4, ll. 12-17) particularly in view of the admitted prior art which discloses it is known to make tube clamps from multiple layers of material. (Pg. 2-3)

As Appellants have noted above, compression molding can be accomplished using different processes that utilize material in different forms. While Wiley et al. is silent as to whether one or more layers of material may be used, Wiley et al. is not silent as to the material used. Wiley et al. clearly states that the clamping shells are made of graphite fiber with random orientation in a polymer matrix (see Wiley et al. at col. 3, lines 45-50). The compression molding process that the Wiley et al. reference teaches, however, is a different process than claimed by Appellants, (see, e.g. claim 11) and one skilled in the art would clearly recognize this difference. Furthermore, resin transfer molding also is a different technique than compression molding. Appellants process utilizes prepreg layup techniques, such as discussed in ASM Handbook, Volume 21, Composites, pages 470-479. This chapter, which discusses prepreg layup, the discussion of compression molding processes (pages 516-535, discussed above) and the discussion of Resin Transfer Molding (pages 492-500) are separate chapters under the Index of the reference for "Manufacturing Processes", which would indicate that each of these molding processes have acquired separate teachings in the art. Thus, to one of skill in the art, it would be understandable that Wiley et al. would be silent as to the use of multiple layers of material, since within the art, compression molding, discussed in Wiley, resin transfer molding, Livesay et al. being a variation thereof, and prepreg lay-up techniques employed by appellants have acquired separate meanings. Hence, one of skill in the art would not look to combine Wiley with the RTM technique of Livesay et al. to obtain appellants' invention. The Examiner

therefore has no basis for the statement that one of ordinary skill in the art would use the multiple layers of Livesay et al. in the Wiley et al. reference. Appellants note that the level of skill in the art as set forth in the ASM Handbook is to the contrary.

In the new Office Action rejection, dated June 16, 2004, the Examiner again adds new reasoning to the previous grounds of rejection, as follows:

> ...and since the thinness of prepregs is well-known in the molding arts. Since the prepregs do not have any exposed fibers, the molded prepregs would not have any exposed fibers since no process was performed on them that would expose fibers. It is noted that the fibers are within the plane of the sheet, i.e. they do not extend beyond the surface of the sheet of curable material since that is the structure of the prepregs.

Appellants note that even though prepregs are thin, Wiley et al. does not disclose prepregs as previously noted, but rather discloses the use of randomly oriented fiber mat. Livesay et al. discloses molding or creating dry preforms by laying up one or more dry layers and infiltrating the dry preform with a resin while drawing a vacuum. Given the distinct teachings of Wiley et al. and Livesay et al. as well as the teachings in the art, the motivation to somehow make this combination is not evident. One would wonder, lacking any apparent motivation, why one interested in making a tube clamp for use in relatively high temperature application, such as a jet engine, would look to the boat hull building arts, in the absence of a clear motivation. The Examiner continues:

> Regarding claims 2-4, Wiley et al. does not disclose pre-pregs where the fibers are all substantially parallel to the plane of the sheet. Doyle discloses a composite tube clamp made from random, or aligned, i.e. oriented, fibers impregnated in a thermosetting resin (Col. 6, ll. 35-50) but does not disclose the aligned fibers being unidirectional, bi-directional, or forming a woven fabric. Livesay et al. discloses that aligned fibers can be unidirectional, bidirectional, or forming woven fabric. Livesay et al. discloses that aligned fibers can be unidirectional or form woven fabric. (Col. 4, ll. 12-17). It would have been obvious to one of ordinary skill in the art a t the time the invention was made to use unidirectional fibers in the tube claim of Wiley since Doyle discloses random and aligned fibers are well-known alternatives when forming a tube clamp and that aligned fibers provide suitable strength to the claim. (Col. 6, ll. 47-50).

Appellants have already noted that Wiley et al. does not disclose pre-pregs, as that term is used in the art, that is woven fabric prepreg or unidirectional tape or sheet (See ASM Handbook,

Volume 21, Composites, pages 470). If the Examiner is to maintain this combination, the Examiner is requested to identify specifically in Wiley et al. where any prepreg, as that term is used in the art, is disclosed. Doyle discloses a composite tube clamp, but does not discuss how it is made. Clearly, there is no discussion of how the composite tube clamp is made, because the orientation of the fibers in Doyle is not an important aspect of the invention. That the orientation is not important is evident in Doyle is apparent from column 6, lines 51-58. As Doyle explains, the abrasion of the fiber (and resin) was believed to provide a lubricant, but the long term impact of the abrading fiber on the tube was not recognized. The Doyle reference is similar to the APA discussed at page 3 of Appellants' specification in that the effect of exposed fiber on the tube was not recognized in the prior art. As discussed above, Livesay et al., while discussing methods of forming preforms by aligning dry sheets or fabric and infiltrating with resin, Livesay et al. does not disclose prepreg sheets as that term is used in the art and laying up the prepreg sheets in the manner suggested by Appellants. The Examiner continues:

> Regarding claim 3, one in the art would appreciate that the aligned fibers of Doyle in the clamp of Wiley could be either unidirectional fibers or woven fabric since Livesay et al. discloses these types of aligned fibers can be used in molding, and since one in the art would use the generally available types of aligned fiber pre-pregs as shown for example by Livesay. (Col. 4, ll.12-17)

These references are not properly combinable for the reasons provided above. MPEP §2145 Subsection D.2 indicates that references cannot be combined where the references teach away from their combination. In this regard, the MPEP states "It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) (The claimed catalyst which contained both iron and an alkali metal was not suggested by the combination of a reference which taught the interchangeability of antimony and alkali metal with the same beneficial result, combined with a reference expressly excluding antimony from, and adding iron to, a catalyst.)." MPEP §2141.02 further requires that the prior art be considered in its entirety, including disclosures that teach away from the claims. More specifically,

> A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) (Claims were directed to a process of

> producing a porous article by expanding shaped, unsintered, highly crystalline poly (tetrafluoroethylene) (PTFE) by stretching said PTFE at a 10% per second rate to more than five times the original length. The prior art teachings with regard to unsintered PTFE indicated the material does not respond to conventional plastics processing, and the material should be stretched slowly. A reference teaching rapid stretching of conventional plastic polypropylene with reduced crystallinity combined with a reference teaching stretching unsintered PTFE would not suggest rapid stretching of highly crystalline PTFE, in light of the disclosures in the art that teach away from the invention, i.e., that the conventional polypropylene should have reduced crystallinity before stretching, and that PTFE should be stretched slowly.).

Here, Wiley et al. and Doyle are not properly combinable for the purpose set forth by the Examiner. Wiley et al. teaches the use of randomly oriented graphite fibers in a compression molded tube clamp. Compression molding has a distinct meaning from the RTM variations used by Livesay et al. and the methods used by appellants. Doyle teaches the use of both randomly oriented fibers and aligned fibers, precisely because fiber orientation is not a consideration in the Doyle teachings. While the disclosure of Doyle with regard to randomly oriented fibers is properly combinable with Wiley et al., the teaching of Doyle with regard to the use of aligned fibers, the combination suggested by the Examiner, is directly contrary to the continuous compression molding teaching of Wiley et al., and hence the proposed combination is not proper under MPEP §2145 D.2, nor is there anything in either reference to lead one skilled in the art to go in the direction suggested by the Examiner, that is, to select the aligned fiber of Doyle for use in Wiley et al., since fiber orientation with regard to the tube surface is not a consideration of either reference.

Claims 2-10 and 31-35 are dependent on claim 1. To the extent that the combination of Wiley et al. in view of Doyle fails to form a proper combination for the rejection of claim 1 based on Wiley et al. in view of Doyle, Livesay et al. and the admitted prior art, it also fails to form a proper combination for the rejection of the claims dependent on claim 1.

The combination of Wiley et al., Doyle and the admitted art has been discussed above as an improper combination. Livesay et al. adds nothing not already disclosed by the prior art. This improper combination is also discussed in the Appeal Brief of March 26, 2004 which discussion is incorporated herein by reference.

In the new Office Action, the specific rejections of claims 4, 10, 11 and 12 is identical to the rejection set forth in the Office Action rejection set forth in Paper 13. Since these rejections and the responses thereto have been set forth identically in the originally filed Appeal Brief, there is no need to repeat them here, and the Board is referred to the originally filed Appeal Brief of March 26, 2004 or to the new Office Action dated June 16, 2004 or to the Paper 13.

With respect to claim 5, the reason for rejection is identical as to that set out in Paper 13, but the support used by the Examiner is different, as the Examiner has removed reference to Alston for support. The Examiner states: "Regarding claim 5, the sheet is formed from graphite fiber with polyimide resin. (Wiley, Col. 3, ll. 49; Doyle, col. 6, ll.40-41)." Appellants note that claim 5 is dependent upon claim 1, incorporating all of the limitations of claim 1, but adds the further limitations that the prepreg sheets are comprised of carbon fibers in a polyimide resin matrix. Inasmuch as the combinations of Wiley et al. and Doyle and alternatively Livesay et al. are infirm for the reasons noted above for claim 1, the fact that they disclose the primary components utilized by Appellants and claimed in claim 5 does not render them viable, as the other elements of claim 1, specifically the contour and no exposure of the fibers is not present.

With respect to claim 4, the Examiner further states: "Regarding claim 4, woven fabrics are considered bi-directional since the warp and weft are oriented in different directions." This is a valid definition and Appellants do not dispute this definition. However, the combination of Doyle and Wiley et al. suggested by the Examiner is directly contrary to the teaching of Wiley et al., which discloses randomly oriented fiber, as discussed above, and, this definition adds nothing to rehabilitate this combination, as woven fabrics are not randomly oriented. As noted, the use of woven fabrics to form a tube clamp is contrary to the teaching of Wiley et al.. The proposed combination remains improper under MPEP §2145 D.2 and the rejection of claim 4 is not proper.

Claim 6-8 are specifically rejected. The Examiner states:

> Regarding claims 6-8, Wiley discloses a clamp with the same thickness throughout. The admitted prior art discloses a clamp with a different thickness in different locations (Figure 1). One in the art would appreciate the method of Wiley, Doyle and the admitted prior art could be used to form other types of clamps such as that of the admitted prior art since they are both clamps used in the airline industry and therefore have the same type of requirements. When forming clamps such as that of the admitted prior art, one in the art would appreciate that a

> filler would be needed between the top and bottom of the clamp as the clamp is not the same thickness throughout and fiber plies are. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use some type of filler such as fiber plies cut to shape since this would fill in the space between the top and bottom of the clamp known in the admitted prior art while using the same types of materials with the same strengths.

With respect to claim 6, the reason for rejection is identical as to that set out in Paper 13, but once again, the support used by the Examiner is different. The Examiner has removed reference to Livesay et al. for support of this rejection. As previously discussed, the present invention solves the problem with abrasion in tube clamps used in applications in which there is inherent movement between the tube and the clamp, particularly abrasion from exposed fibers. Wiley et al., Doyle, and the admitted prior art have been discussed above. All that has been said regarding these references is equally applicable to this rejection and will not be repeated for brevity. The combination of Wiley et al. and Doyle is infirm for the reasons stated previously. Furthermore, the fact that the admitted prior art may disclose the use of plies does not rehabilitate the infirm combination of Wiley et al. and Doyle that forms the foundation of this rejection. Appellants observe that the Examiner has failed to note, as Appellants have taught at page 3 of their specification, that composite clamps of different thicknesses have been manufactured by machining a clamp of uniform thickness to the desired size and shape, the machining operation undesirably exposing fibers. The prior art failed to recognize the problems associated with the exposure of the fibers and resultant wear of the exposed fibers on the tube clamp, which is evident as well in both Wiley et al. and Doyle, relied upon by the Examiner. Since the prior art is devoid of the recognition of the problem, it was not until Appellants' invention that the solution of aligning the fibers so that no fibers in the tube clamp adjacent to the tube are exposed. Under MPEP §2141.02, "Differences Between Prior Art and Claimed Invention", the invention as a whole must be considered. Part of this inquiry involves discovering the source of the problem, even though the solution may be evident once the source of the problem is discovered. Here, the art, as Appellant maintains including the art relied upon by the Examiner, did not and does not recognize the problem associated with exposed fiber. Appellants recognized the problem and devised a solution, as set forth in their application and claims. These dependent claims 6-8 include all of the limitations of independent claim 1, and add additional limitations, claim 1 not being obvious over the cited art as discussed above.

With regard to claims 10 and 11, the Examiner states:

> Regarding claims 10 and 11, Wiley discloses the clamp is compression molded. (Col. 3, ll. 50-51) but does not disclose the exact type of apparatus used. Livesay et al. discloses products can be formed by laying up dry fiber mats, impregnating them with resin, and autoclaving them. (Col. 1, ll. 29-39). It would have been obvious to one of skill in the art at the time the invention was made to layer up dry fiber layers, impregnate them with resin, and autoclave them, since Livesay et al. discloses this method forms structures with high strength-to weight ratios (Col. 1, ll. 16-20) as would be required for a clamp.

Claim 10 is dependent on claim 1 and will be discussed separately from independent claim 11. Claim 10 incorporates all of the limitations of claim 1 and adds further limitations. Claim 10 does not discuss the infiltration of dry mat. As Appellants have already noted each of the techniques described above, Wiley's compression molding and Livesay's patented modification of RTM have acquired separate status in the art. They are not properly combinable and there is nothing to suggest their combination, except the Examiner's improper hindsight reasoning. Even if combinable, they would not yield Appellants' technique which is a modification of prepreg lay-up in combination with RTM to yield the tube clamp of the present invention. Appellants submit that there is nothing in this argument that rehabilitates the infirm combination of Wiley in view of Doyle as discussed above, which arguments are applicable to this rejection and are not repeated for the sake of brevity.

The rejection of independent claim 11 is also improper. Wiley teaches the use of randomly oriented fibers, as previously discussed. Doyle is not discussed specifically by the Examiner here, but the rejection of claim 11 initially was based on the combination of Wiley et al. in view of Doyle, Livesay et al. and the admitted prior art. To the extent that Doyle remains part of this rejection, all that was stated above with respect to the rejection of Wiley et al. in view of Doyle is equally applicable to this rejection. With regard to the embodiment of the invention intended to be covered by claim 11, claim 11 does not disclose laying up dry fiber mat, as attributable to Livesay et al. by the Examiner, but rather curable material having embedded fibers. This would include fiber impregnated sheets (prepreg sheets) cut to size, such as for example sheets 31 of Figure 2. Additional polymer is injected to fill any void areas between the prepreg sheets. Thus to the extent that this rejection does not include the infirm combination of Wiley et al. in view of

Doyle, it is discussed in Section B below (or in the prior Appeal Brief) as not yielding Appellants' invention. To the extent that the rejection does include this infirm combination, it is improper, as discussed above.

Claim 12 is also rejected. The Examiner states:

> Regarding claim 12, Wiley discloses the process to make a clamp. One in the art would understand that a clamp would have two halves, both made via the same molding technique.

This identical rejection of claim 12 was discussed in the Appeal Brief of March 26, 2004, and that response is incorporated herein by reference. The Board is referred to that section of the Brief for the response.

Claim 31 is rejected under 35 U.S. C. §103(a) as unpatentable over Wiley et al. in view of Doyle, Livesay et al and the admitted prior art as applied to claim 2 above, and further in view of Yamamoto et al. The Examiner states:

> The references cited do not disclose different plies of unidirectionally oriented fibers arranged in directions so the fibers are at an angle to each other. It is well known in general in the fiber prepreg arts to orient different layers of unidirectional fibers in different directions so that the web is not weak in any one direction in particular as shown for example by Yamamoto et al. which discloses layering multiple payers of unidirectional plies so that fibers are oriented in different directions. (Figure 6). It would have been obvious to one of ordinary skill in the art at the time the invention was made to orient different plies of unidirectional fibers in different directions since it is well-known in the general in the fiber prepreg arts to do so as shown for example by Yamamoto et al. (Fig. 6).

This identical rejection of claim 31 was discussed in the Appeal Brief of March 26, 2004, and that response is incorporated herein by reference. The Board is referred to that section of the Appeal Brief for the response.

B. Re Wiley In View of Doyle, Livesay et al. and Admitted Prior Art, Even If Properly Combinable, Do Not Yield Appellants' Claimed Invention

Wiley in view of Doyle, Livesay et al. and the admitted prior art have been discussed above and in the Appeal Brief of March 26, 2004, which responses are incorporated by reference

herein. A summary of these references will not be repeated here nor will the arguments against their combination. The Board is referred to these prior arguments.

C. Re The Claimed Invention as a Whole Must Be Considered

The arguments for ascertaining the differences between the prior art and the claimed invention as a whole was discussed in the Appeal Brief of March 26, 2004, and that response is incorporated herein by reference. The Board is referred to that section of the Appeal Brief for the response.

D. Re Combination of Wiley in view of Doyle, Livesay et al. and the Admitted Prior Art is Based on Hindsight Reasoning by the Examiner.

Wiley, Doyle, Livesay et al. and the admitted prior art was discussed in the Appeal Brief of March 26, 2004, and that response is incorporated herein by reference. The Board is referred to that section of the Appeal Brief for the response.

E. Re claim 11 is not properly rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirements.

Claim 11 is rejected under 35 U.S.C.§112 as failing to comply with the written description requirement. The Examiner states:

> The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. One in the art reading the application would not have understood that the applicant intended to use curable resin sheets with imbedded fibers in a resin transfer molding process since the specification indicates that pre-impregnated fiber plies can be replaced by resin transfer molding (Pg. 10, ll. 6-7), particularly since conventional resin transfer molding uses fiber sheets not containing resin particularly since the second paragraph indicates sheets of fiber are used.

The Examiner incorrectly interprets the specification as indicating that preimpregnated fiber plies can be replaced by resin transfer molding, as noted in the above quotation. This incorrect interpretation is much narrower than what is taught by the specification and claimed in the claims. Preimpregnated plies or sheet along the contours of the tooling are a claim element in each of claims 1, 11 and 16. Replacement of these critical plies with RTM could result in the exposure of fiber ends, thereby negating the purpose of the invention and one of the claim

limitations. In the present invention, filler material 26 lying between top ply layer 38 and bottom ply layer 34 can utilize, in one embodiment, RTM. Of course, since this filler material 26, added to fill voids, lies between top and bottom ply layers 38 and 34 respectively, the exposure of fiber ends is not possible. This is but one arrangement of the filler material between the top and bottom ply layers, and Appellants refer to page 9, lines 15-30, which describe the other acceptable arrangements of the filler material 26.

Appellants direct the Board's attention to the application where the first element of claim 11 is set forth. Even though one skilled in the art would recognize "sheets of curable material," at page 7 line 1 and extending to page 8 through line 7, plies (also referred to as sheet at page 7, line 3) are described as being fibers embedded in curable material, the preferred fibers and the preferred polymers to be used in the curable fiber reinforced sheets are identified. Preferred thicknesses of sheets are identified at page 10 in the paragraph beginning at line 1. As the plane formed by the fibers embedded in polymer is not infinite, which would make the invention inoperable, the sheets are not infinite in length or width.

The second element of claim 11, "layering the plurality of sheets..." is found by reference to the specification and the drawings. Referring now to Figure 2 and 3 of the application, a plurality of sheet are depicted as layered along a contour of the tooling. Copies of these Figures are provided as an attachment to this Supplemental Appeal Brief. This is also described at page 7 in the paragraph beginning at line 13 in which it is stated that prepreg plies or sheet 22 are layered to the contour of the layup tooling.

The third element, "injecting the polymer.." is discussed in the specification. At page 9 of the specification, variations of the invention are discussed. One of the variations set forth is use of a variety of material as filler material 26. The specification is clear that the filler material 26, depicted as cut plies 31 in Figure 2 (as discussed at page 9, lines 14-17) may optionally include polyimide resin, chopped fiber molding compound, plies cut to shape, or other types of fillers, such as for example, polyimide ceramic foams, or *mixtures of these filler* (emphasis added). The purpose of the filler material is to fill void regions between the top ply layer 38 and the bottom ply layer 34. In elaborating on this technique, at page 10, lines 5-8 of the specification, the specification notes that the pre-impregnated fiber plies can be replaced by

techniques such as resin transfer molding. As is well known in the art, resin transfer molding (RTM) injects pressurized resin (*See*, for example ASM Handbook, Volume 21, Composites, page 490). Here the pressurized resin is one of the components of the permissible (and described) fillers. Appellants note that the claim limitation of "*injecting*" is a narrow limitation and that appellants are entitled to claim more broadly, as described in the paragraph beginning at page 9, line 14 which states "void regions between the top ply layer and the bottom ply layer are "*filled*", for example, with a mix of polymer resin and chopped fiber" in the paragraph beginning at page 9, line 14.

The next element is "curing the impregnated fiber bundle..." Curing the material is set forth in the specification at pages 4-5 and at page 10, lines 7-12.

The final step in the process " removing said cured material..." is discussed at page 4 in the paragraph beginning at line 23.

The Examiner's position that one skilled in the in art would not have understood that the Appellant intended to use curable resin sheets with embedded fibers in a resin transfer molding (RTM) process is without foundation. One skilled in the art, reading the application would have understood that the appellants were in possession of the concept, at the time the application was filed, of using curable resin sheets with embedded fibers in conjunction with an RTM process, as well as a lay-up that does not use preimpregnated fiber sheets, but which are impregnated by RTM and combinations in which both preimpregnated fiber sheets and non-impregnated fiber sheets are utilized and injecting resin is additionally used to assist in filling the voids. The improvement of the present invention is due to the fibers in the composite lying parallel to the surface as defined by top layer 38 and bottom layer 34. Strength is imparted to the region between the top and bottom layers, by filler material 26, which filler material is as specified on page 9 in the paragraph beginning at line 14, which is provided by filler material 26 to generally fill the otherwise void region. One of the specific methods of filling is set forth in the next paragraph on page 10, which optionally identifies RTM processing, known by those skilled in the art to require injection of polymer under pressure. It is abundantly clear to one skilled in the art that the appellants were in possession of all of the above techniques at the time the

application was submitted. Thus the Examiner's position is without support, and the rejection of claim 11 as failing to comply with the written description requirement should be withdrawn.

F. Whether claim 11 is properly rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention.

Claim 11 is rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to point out and distinctly claim the subject matter of the invention. The Examiner states: "Claim 11 recites the limitation 'the plurality of sheets of fiber' in line 6. There is insufficient antecedent basis for this limitation the claim."

Appellants specifically point out that the first element of the claim states "providing a plurality of sheets of curable material having embedded fiber" provides the necessary antecedent basis. It is abundantly clear that the antecedent basis for the plurality of sheets of fiber exists and the rejection should be withdrawn. The sheets include fiber as well as curable material, but there can be no dispute that the sheets include fiber. Appellants note that the additional phrase "of fiber" with reference to the sheets is extraneous, as the antecedent basis is clear, but deletion of the term "of fiber" would not affect the meaning of the claim if the Board should disagree with Appellants' position and determine that the additional included phrase "of fiber" somehow renders "the plurality of sheets" indefinite in this claim.

G. Rebuttal to Examiner's Response to Arguments

To the extent the Examiner's comments are not addressed below, they have been addressed in the preceding. However, the additional comments are provided to further clarify Appellants' position.

Appellants do not concede that Wiley et al. discloses a single ply of prepreg. Wiley et al. discloses randomly oriented fiber mat, as used in GMT, which is a different form of material than a single ply of prepreg, as would be recognized by one of skill in the art.

Appellants note that slicing operations may or may not produce fiber ends exposed to the surface of the tube. The exposure of the tube to fiber ends is the critical problem that the present

invention solves. Regardless of whether the fiber ends are exposed by slicing, the random nature of the fibers used in fiber mat, such as used in Wiley et al. will expose the ends of fibers in the clamp to the tube. A slicing orientation that is not properly selected will simply exacerbate this condition. As shown in Figures 2 and 3, while the tube clamp of the present invention is sliced in a direction parallel to the direction of the tube (i.e. along the tube axis) and away from the interface between the tube and clamp so as not to expose fiber ends in this critical interface region in which the fiber used in the clamp runs substantially parallel to the surface of the tube. The prepreg sheets are laid up so that the fiber in the plies that form the interface follow the contour of the tube (i.e. the sheets are parallel to the tube axis) so as not to expose the end of the fiber to the tube.

Regarding Wiley's use of a grommet, the Examiner is requested to clarify whether she is asserting that the grommet 12 , which holds the tube firmly in place, provides no spacing between the tube clamp and the tube. Appellants have not asserted a negative claim limitation identifying a lack of a grommet, as the process claimed by Appellants will produce a clamp that does not require a grommet, or other spacing means, to prevent contact between exposed fiber ends of the tube clamp and the tube.

In response to the argument regarding Doyle's disclosure of fibers as abrading, the Examiner has misconstrued the Appellants' invention with that of Doyle, and the advantages derived from each invention. What Doyle considers an advantage, Appellants teach is undesirable, i.e. a disadvantage. Doyle did not appreciate that the exposed fiber ends could damage the tube, hence Doyle teaches the use of mat having randomly oriented fiber. One skilled in the art will also recognize that there are different ways to lay up fiber containing sheets. Doyle is silent as to how the material is laid up, or even if prepreg sheet is used as lay-up material, or how the tube clamp is molded. Furthermore, there is no teaching in Doyle that the aligned fibers, when used, are laid up parallel to the surface of the tooling, and hence to the surface of the tube, so that exposed tube ends are prevented. Inasmuch as Doyle discloses that fiber abrading is a positive attribute, an advantage, there is no teaching or suggestion to lead one skilled in the art to conclude that Doyle would lay up the fibers parallel to the surface of the tooling as taught by Appellants. In fact, this teaching suggests that aligned fibers would be laid up so as to allow fabric ends to be exposed when placed in service.

With regard to the Examiner's argument regarding accidental error when amending the claims, as Appellants have aptly demonstrated above, by reference to the specification, the Appellants were in possession of the invention claimed in claim 11 at the time of filing the invention. The use of a variety of fillers between the top ply layer 38 and the bottom ply layer 34 was clearly contemplated, and claim 11 is just one of the embodiments, See page 9, lines 14-30.

With regard to the Examiner's argument that applicants' own specification discloses random fiber composites, Appellants acknowledge this to be true. Appellants also note that the claims as originally filed included claims to such structure, but, during the prosecution of the application, such claims were cancelled responsive to a rejection. There no longer are claims to such a structure. Is the Examiner seeking to reject a canceled claim?

Doyle does not preclude machining the clamp to shape. It does not disclose molding the clamp to net shape or near net shape. In the absence of a teaching of net shape molding or near net shape molding, the specification being silent as to how the clamp is made as noted by the Examiner, and inasmuch as the tube clamps taught by Doyle may also be metal (casting being the metal equivalent of composite near net shape molding), see column 6, lines 12-34, Appellants are aware of no other techniques except machining to arrive at the complex configuration of the Doyle article, there being no distinction between the formation of the final configuration of metal and composite tube clamps in Doyle.

SUMMARY

In summary, Appellants claim a process for forming a tube clamp comprising the steps of providing a plurality of sheets of curable material having embedded fibers (prepreg). Each of the independent claims includes this limitation. The fibers are aligned so as to be parallel to the surface to layup tooling, (i.e. along the contour of the tooling) the layup tooling having a preselected shape to yield the desired contours of the tube clamp. The sheets of laid up curable material is cured to at least near net shape, so that little or no subsequent operations are required to be performed thereon to expose the fibers, and the cured material is removed from the tooling without exposing the fibers. The sheets preferably include unidirectionally oriented fiber, although bidirectionally oriented (woven) fiber may be used, the bidirectional fibers lying

substantially in a plane. The sheets may also be laid up so that adjacent sheets have fibers in adjacent, parallel sheets running at an angle to one another. Filler material may be added as cut plies or as random fiber materials to areas away from the surface of the tube clamp so as to add strength to the clamp, but without jeopardizing the integrity of the surface of the clamps. The filler material is added between the top ply layer 38 and the bottom ply layer 34. As claimed, the top ply layer and the bottom ply layer can be prepreg ply sheets, prepreg ply sheets comprised of either aligned (unidirectional) fiber or woven (bidirectional) fiber. In one embodiment, the filler may be prepreg sheet, cut to size and laid up (placed in the appropriate position, resin may be injected to fill any voids). In another embodiment, the filler may be dry, woven fabric that is laid up (placed in the appropriate position) and impregnated with resin. In a third embodiment, resin with randomly oriented fiber may be injected as filler. However, regardless of the filler used, the prepreg is aligned so that there are no exposed fibers after curing of the tube clamp, and placing the tube clamp into service in contact with a tube.

The claimed invention is unlike the cited prior art. While cited art Wiley and Doyle teach the same materials taught by Appellants in a tube clamp, neither teach the arrangement of the materials as taught by Appellants. Both Wiley and Doyle teach away from Appellants' claimed invention. Doyle teaches away from Appellants' invention by allowing the use of randomly oriented fibers. Although Doyle does teach the use of aligned fiber to make a flat plate, it does not teach the use of prepreg and it does not teach the process of aligning the fiber along a contour so that a near net shape is achieved. The aligned fibers of Doyle oriented in any other direction will result in exposed fiber ends. Doyle includes no disclosure of processing techniques. Furthermore, Wiley suggests to one skilled in the art to use the random fiber alternative disclosed in Doyle and not the aligned fiber alternative selected by the Examiner. Doyle also teaches that exposed fiber is beneficial in that it can produce powders that act as lubricant, contrary to Appellants' teachings. The tube clamp contours disclosed in Doyle appear to be achieved by machining the flat plate cured composite, which is disclosed in Appellants' admitted art as unacceptable. Clearly, none of the prior art relied on by the Examiner recognizes the problem solved by the Appellants' invention. Appellants respectfully submit that the combination of references used by the Examiner to reject Appellants' claims is improper. Appellants further submit that this combination does not yield Appellants' invention as claimed.

When the claims are viewed against the cited references as a whole, Appellants' claims are not obvious. The Examiner arrives at this combination as a result of impermissible hindsight. Even, if proper, the combination does not yield Appellants' invention. The Examiner attempts to combine different processing techniques to achieve Appellants' invention. These techniques have acquired separate status in the art and are not otherwise combinable. The Wiley reference clearly teaches compression molding, while the Livesay et al. reference, directed to building of boat hulls, utilizes a variation of RTM techniques to manufacture preforms. Both of these processes are different from the prepreg lay-up techniques (combined with RTM techniques in certain embodiments as discussed above) which has its own status in the art. Thus, the combination, for which no motivation is suggested, even if proper, does not disclose Appellants' process for manufacturing a tube clamp. Accordingly, favorable consideration of this appeal is respectfully requested.

Respectfully submitted

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Dated: September 14, 2004

Appendix – Claims 1-12, 31-35.

Drawings 1-3

APPENDIX 1

A copy of the appealed claims, as presented in the most recent amendment, is provided below. Claims cancelled without prejudice, but not part of this appeal, are not provided.

1. A process for forming a tube clamp comprising the steps of:

providing a plurality of sheets of curable material having embedded fibers, each sheet having a length and a width to form a plane, and a thickness, the fibers embedded in the curable material to form a matrix in which the fibers are substantially within the plane of the sheet;

layering the plurality of sheets of curable material to a preselected thickness along a contour of layup tooling having a predetermined shape;

curing said material to at least near net shape; then

removing said cured material from said layup tooling while retaining the shape of said layup tooling without exposing fibers.

2. The process of claim 1 wherein the step of providing the plurality of sheets and layering of the plurality of sheets further includes layering sheets of unidirectionally oriented fibers in a polymer resin matrix, and wherein the step of removing said cured material further includes removing said cured material while maintaining the fibers along the contour of the layup tooling as continuous.

3. The process of claim 1 wherein the step of providing a plurality of sheets and layering of sheets further includes providing and layering sheets of woven fibers in a polymer resin matrix, and the step of removing said cured material further includes removing said cured material while maintaining the fibers along the contour of the layup tooling as continuous.

4. The process of claim 1 wherein the step of layering of sheets further includes layering sheets of fibers bi-directionally oriented fibers in a polymer resin matrix, the bi-directionally oriented fibers lying within the plane of the plurality of sheets.

5. The process of claim 1 wherein the curable matrix is a polyimide resin matrix and the fibers are carbon fibers.

6. The process of claim 1 wherein the step of layering a plurality of sheets includes layering a first plurality of sheets to a predetermined thickness to form a bottom ply layer, layering a

second plurality of sheets to a predetermined thickness to form a top ply layer, and further includes sandwiching filler material between the top ply layer and the bottom ply layer.

7. The process of claim 6 wherein the filler material includes a plurality of plies cut to a predetermined shape to fill a region between the bottom ply layer and the top ply layer.

8. The process of claim 7 wherein the step of sandwiching filler material between the top ply layer and the bottom ply layer includes layering sheets of random fiber mat comprising chopped fiber in polymer resin, between ply layers comprising sheets having fibers embedded in the curable material to form a matrix in which the fibers are substantially within the plane of each sheet so that the tube clamp adjacent to a tube includes no exposed fiber.

9. The process of claim 1 wherein the step of curing includes autoclaving said material at a predetermined temperature and pressure.

10. The process of claim 1 wherein the step of curing includes processing in a match metal press having a movable upper platen at a predetermined temperature and pressure.

11. A process for forming a tube claim comprising the steps of:

providing a plurality of sheets of curable material having embedded fibers, each sheet having a length and a width to form a plane, and a thickness, the fibers embedded in the curable material to form a matrix in which the fibers are substantially within the plane of the sheet;

layering the plurality of sheets of fiber to form a fiber bundle of a preselected thickness along a contour of layup tooling having a predetermined shape;

injecting polymer into the tooling to the impregnated fiber bundle;

curing the impregnated fiber bundle to at least near net shape;

then removing said cured material from said layup tooling while retaining the shape of said layup tooling without exposing fibers.

12. A process for forming a tube clamp comprising the steps of:

providing a plurality of sheets of curable material having embedded fibers, each sheet having a length and a width to form a plane, and a thickness, the fibers embedded in the curable material to form a matrix in which the fibers are substantially within the plane of the sheet;

layering a first plurality of sheets of the curable material to a preselected thickness along a contour of a first layup tooling having a first predetermined shape;

layering a second plurality of sheets of curable material having fibers embedded in a curable matrix to a second preselected thickness along a contour of second layup tooling having a second predetermined shape, the first predetermined shape and second predetermined shape having mating interfaces;

curing said first plurality of sheets of curable material and second plurality of sheets of curable material to net shape;

removing the cured material from said first and second layup tooling while retaining the contour of said toolings having predetermined shapes without exposing fibers; and

mating said cured material from said first and second layup tooling along the mating interfaces.

13. – 30. Cancelled without prejudice.

31. The process of claim 2 wherein the layering the sheets of the unidirectionally oriented fibers further includes layering adjacent sheets so that the fibers in the adjacent sheets are angled at predetermined angular orientations.

32. The process of claim 6 wherein layering a first plurality of sheets to a predetermined thickness to form a bottom layer includes layering sheets of unidirectional fiber.

33. The process of claim 6 wherein layering a first plurality of sheets to a predetermined thickness to form a bottom layer includes layering sheets of woven fiber.

34. The process of claim 6 wherein layering a second plurality of sheets to a predetermined thickness to form a top layer includes layering sheets of unidirectional fiber.

35. The process of claim 6 wherein layering a second plurality of sheets to a predetermined thickness to form a top layer includes layering sheets of woven fiber.

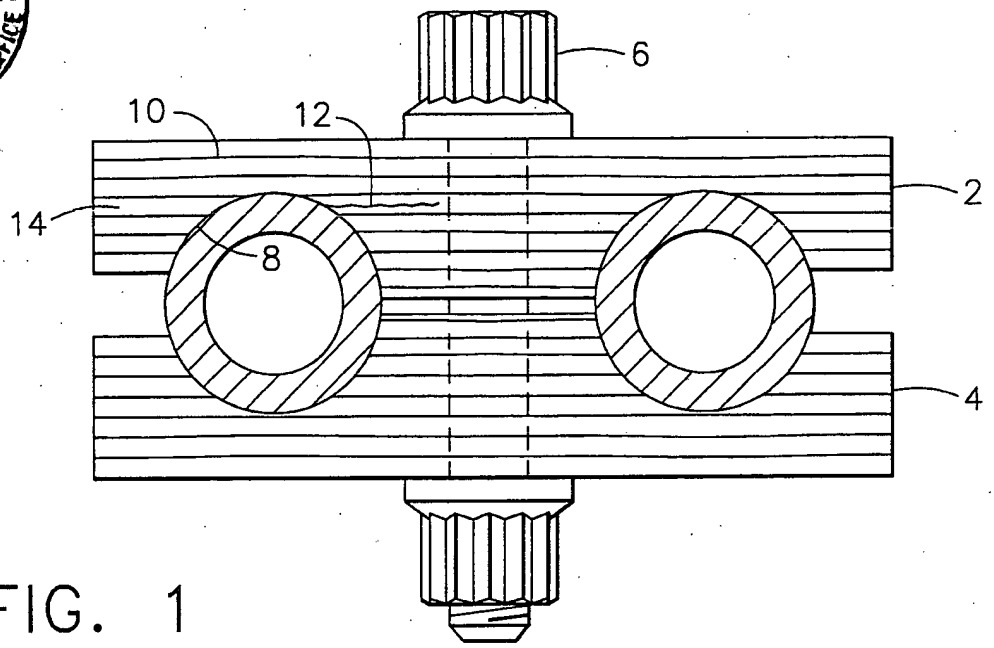

FIG. 1
(PRIOR ART)

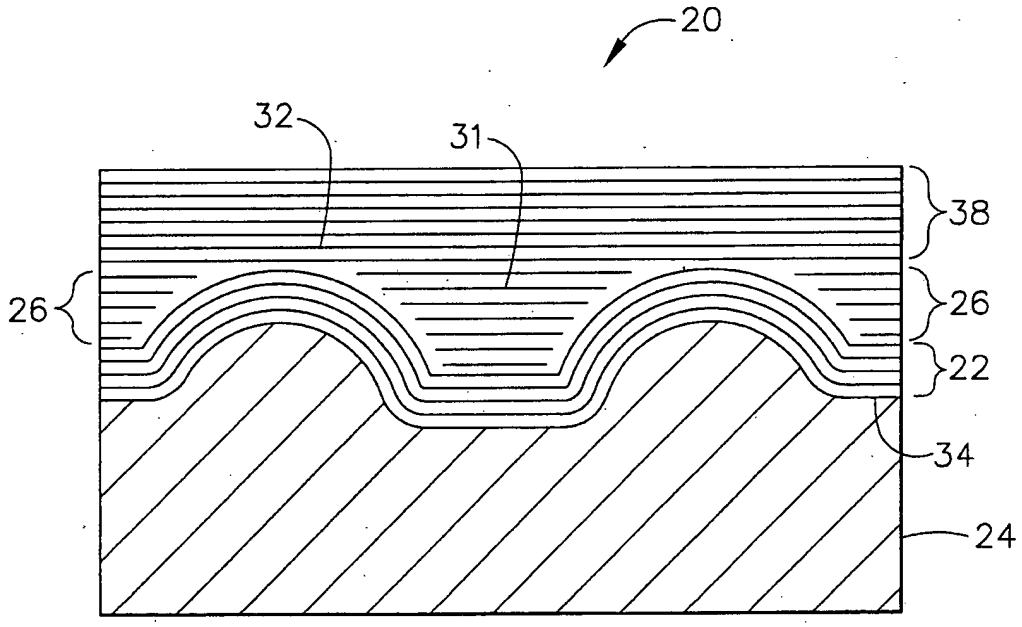

FIG. 2

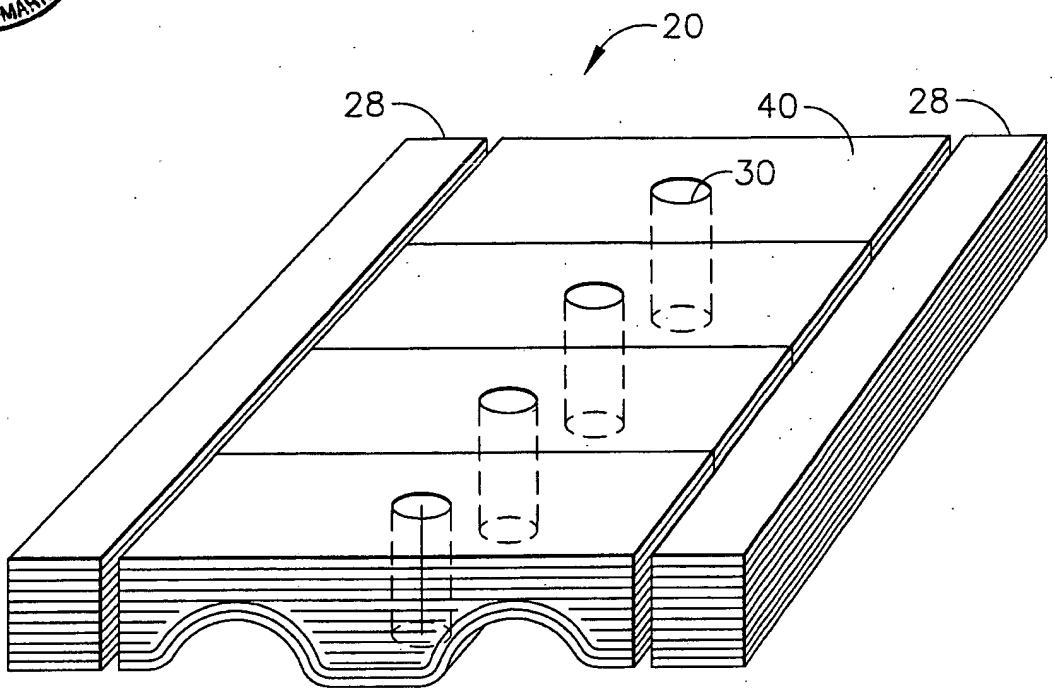

FIG. 3